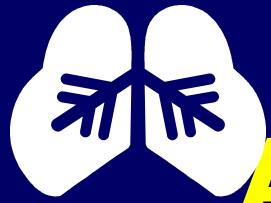


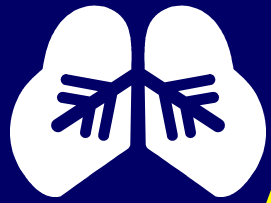
Management of Asthma Exacerbations: Key Points

- Early treatment is best. Important elements include:
 - A written action plan
 - Guides patient self-management of exacerbations at home
 - Especially important for patients with moderate-to-severe persistent asthma and any patient with a history of severe exacerbations
 - Recognition of early signs of worsening asthma



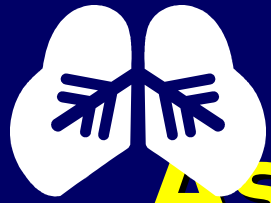
Management of Asthma Exacerbations: Key Points (continued)

- Appropriate intensification of therapy
- Prompt communication between patient and clinician about:
 - Serious deterioration in symptoms or peak flow, or
 - Decreased responsiveness to inhaled beta₂-agonists, or
 - Decreased duration of beta₂-agonist effect



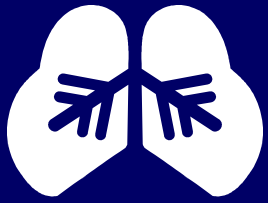
Management of Asthma Exacerbations

- Inhaled beta₂-agonist to provide prompt relief of airflow obstruction
- Systemic corticosteroids to suppress and reverse airway inflammation
 - For moderate-to-severe exacerbations, or
 - For patients who fail to respond promptly and completely to an inhaled beta₂-agonist



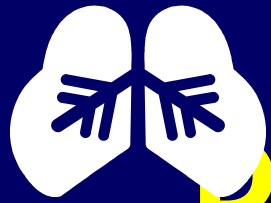
Management of Asthma Exacerbations (continued)

- Oxygen to relieve hypoxemia for moderate-to-severe exacerbations
- Monitoring response to therapy with serial measurements of lung function



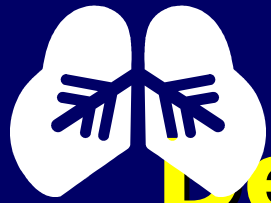
Risk Factors for Death From Asthma

- Past history of sudden severe exacerbations
- Prior intubation or admission to ICU for asthma
- Two or more hospitalizations for asthma in the past year
- Three or more ED visits for asthma in the past year



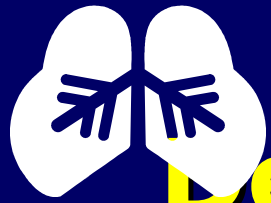
Risk Factors for Death From Asthma (continued)

- Hospitalization or an ED visit for asthma in the past month
- Use of >2 canisters per month of inhaled short-acting beta₂-agonist
- Current use of systemic corticosteroids or recent withdrawal from systemic corticosteroids



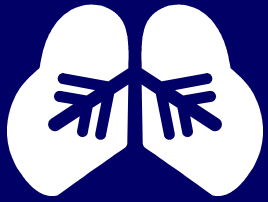
Risk Factors for Death From Asthma (continued)

- Difficulty perceiving airflow obstruction or its severity
- Comorbidity, as from cardiovascular diseases or chronic obstructive pulmonary disease
- Serious psychiatric disease or psychosocial problems



Risk Factors for Death From Asthma (continued)

- Low socioeconomic status and urban residence
- Illicit drug use
- Sensitivity to *Alternaria*



Home Management of Exacerbations: Written Action Plan

- Develop a written action plan with each patient, especially those with:
 - Moderate-to-severe persistent asthma or
 - History of severe exacerbations

ASTHMA ACTION PLAN FOR

Doctor's Name _____

Date _____

Doctor's Phone Number _____

Hospital/Emergency Room Phone Number _____

GREEN ZONE: Doing Well

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,**Peak flow:** more than _____
(80% or more of my best peak flow)

My best peak flow is: _____

Take These Long-Term-Control Medicines Each Day (include an anti-inflammatory)

Medicine	How much to take	

Before exercise☐ 2 or ☐ 4 puffs 5 to 60 minutes before exercise**YELLOW ZONE: Asthma Is Getting Worse**

- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all, usual activities

-Or-**Peak flow:** _____ to _____
(50% - 80% of my best peak flow)**Add: Quick-Relief Medicine – and keep taking your GREEN ZONE medicine**(short-acting beta₂-agonist)☐ 2 or ☐ 4 puffs, every 20 minutes for up to 1 hour
☐ Nebulizer, once**If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:**

- ☐ Take the quick-relief medicine every 4 hours for 1 to 2 days.
- ☐ Double the dose of your inhaled steroid for _____ (7-10) days.

-Or-**If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:**

- ☐ Take: _____ ☐ 2 or ☐ 4 puffs or ☐ Nebulizer
(short-acting beta₂-agonist)
- ☐ Add: _____ mg. per day For _____ (3-10) days
(oral steroid)
- ☐ Call the doctor ☐ before/ ☐ within _____ hours after taking the oral steroid.

RED ZONE: Medical Alert!

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

-Or-**Peak flow:** less than _____
(50% of my best peak flow)**Take this medicine:**

- ☐ _____ ☐ 4 or ☐ 6 puffs or ☐ Nebulizer
(short-acting beta₂-agonist)
- ☐ _____ mg.
(oral steroid)

Then call your doctor NOW. Go to the hospital or call for an ambulance if:

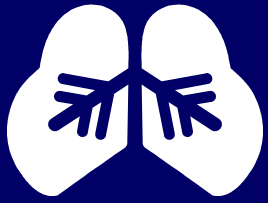
- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

DANGER SIGNS

- Trouble walking and talking due to shortness of breath
- Lips or fingernails are blue

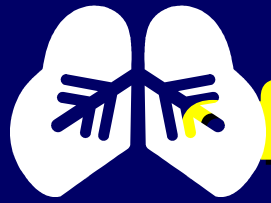


- Take ☐ 4 or ☐ 6 puffs of your quick-relief medicine **AND**
- Go to the hospital or call for an ambulance (_____) **NOW!**



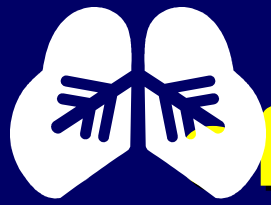
Home Management of Exacerbations: Written Action Plan (continued)

- The plan should include:
 - Signs, symptoms, and peak flow levels that indicate deteriorating asthma
 - How to adjust medications in response to deteriorating asthma
 - When to seek medical help
 - Emergency phone numbers



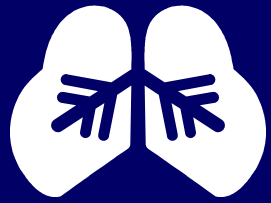
Home Management of Exacerbations: What To Teach Patients and Caretakers

- Recognize symptoms and signs of deterioration
- Monitor peak flow if patient has:
 - Moderate-to-severe persistent asthma or
 - History of severe exacerbations



Home Management of Exacerbations: What To Teach Patients and Caretakers (continued)

- Seek medical help early if:
 - Exacerbation is severe
 - Therapy does not give rapid, sustained improvement
 - Condition worsens
- Keep necessary medications and equipment at home and take when traveling

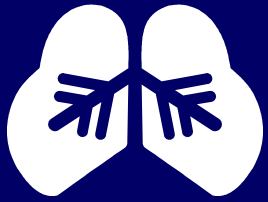


Home Management of Exacerbations: Instructions to Patient

- Use inhaled short-acting beta₂-agonist:
 - Up to three treatments of 2 to 4 puffs by inhaler at 20-minute intervals

OR

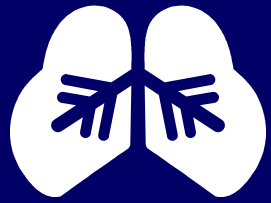
- Single nebulizer treatment
- Assess symptoms and/or peak flow after 1 hour



Home Management of Exacerbations:

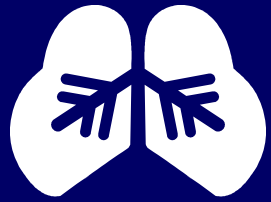
Good Response (Mild Exacerbation)

- Peak flow $>80\%$ predicted or personal best and/or
- No wheezing, shortness of breath, cough, or chest tightness and
- Response to beta₂-agonist sustained for 4 hours



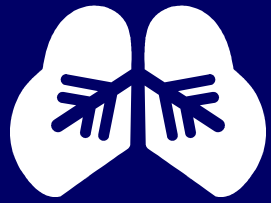
Home Management of Exacerbations: Instructions for Good Response

- May continue 2 to 4 puffs beta₂-agonist every 3 to 4 hours for 24 to 48 hours PRN
- For patients on inhaled corticosteroids, double dose for 7 to 10 days
- Contact clinician within 48 hours for instructions



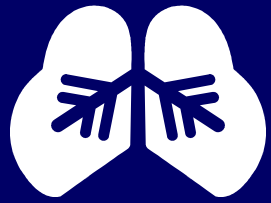
Home Management of Exacerbations: Incomplete Response (Moderate Exacerbation)

- Peak flow 50% to 80% predicted or personal best or
- Persistent wheezing, shortness of breath, cough, or chest tightness



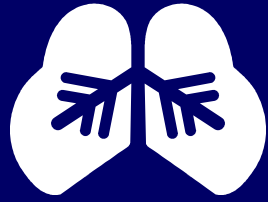
Home Management of Exacerbations: Instructions for Incomplete Response

- Take 2 to 4 puffs beta₂-agonist every 2 to 4 hours for 24 to 48 hours PRN
- Add oral corticosteroid for 3 to 10 days, at least until symptoms and peak flow are stable
- Contact clinician urgently (same day) for instructions



Home Management of Exacerbations: Poor Response (Severe Exacerbation)

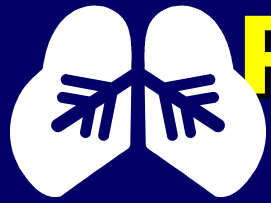
- Peak flow <50% predicted or personal best, or
- Marked wheezing, shortness of breath, cough, or chest tightness, or
- Distress is severe and nonresponsive, or
- Response to beta₂-agonist lasts <2 hours



Home Management of Exacerbations: Instructions for Poor Response

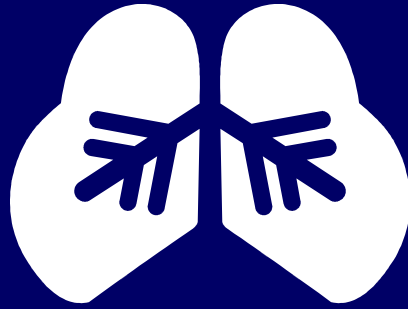
IMMEDIATELY

- Take up to three treatments of 4 to 6 puffs beta₂-agonist every 20 minutes PRN
- Start oral corticosteroid
- Contact clinician
- Go to emergency department or call ambulance or 9-1-1

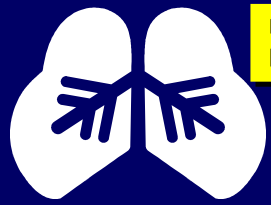


Prehospital Ambulance Management

- Administer supplemental oxygen
- Administer inhaled beta₂-agonist
- If inhaled therapy is not available, use subcutaneous terbutaline or epinephrine



Emergency Department and Hospital Management

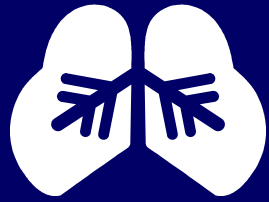


Emergency Department Functional Assessment

Measure FEV_1 or PEF:

- Upon presentation (begin treatment as soon as asthma exacerbation is recognized)
- After first β_2 -agonist dose
- After third β_2 -agonist dose
- At intervals depending on response to therapy
- Before discharge

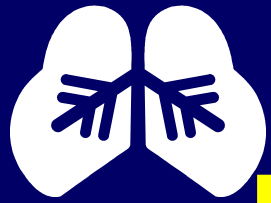
Monitor SaO_2 in patients with severe distress
or with FEV_1 or PEF $<50\%$ predicted



Emergency Department and Hospital Management: Brief History

(after treatment is initiated)

- Time of onset and cause of exacerbation
- Severity of symptoms, especially compared to previous attacks
- All current medications and time of last dose

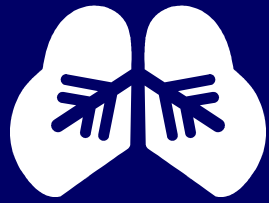


Emergency Department and Hospital

Management: Brief History (after treatment is initiated)

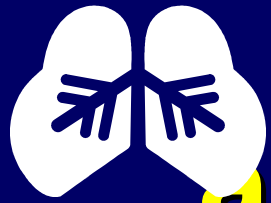
(continued)

- Prior hospitalizations and ED visits, especially in past year
- Prior episodes of respiratory failure or loss of consciousness due to asthma
- Existence of comorbidities



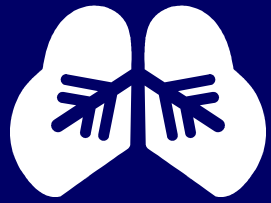
Emergency Department and Hospital Management: Brief Physical Exam

- Assess severity: Alertness, distress, accessory muscle use, tachycardia, tachypnea, pulsus paradoxus, cyanosis
- Identify complications (e.g., pneumonia, pneumothorax, pneumomediastinum)
- Identify diseases that affect asthma (otitis, rhinitis, sinusitis)
- Rule out upper-airway obstruction



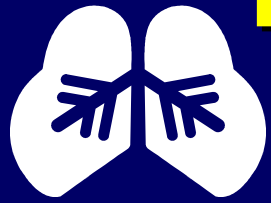
Emergency Department and Hospital Management: Laboratory Assessment

- Consider ABG in patients with suspected hypoventilation, severe distress, or with FEV_1 or PEF $<30\%$ predicted after initial treatment
- CBC may be appropriate in patients with fever or purulent sputum
- Serum theophylline concentration
- Serum electrolytes, chest x-ray, ECG in special circumstances



Emergency Department and Hospital Management: Goals

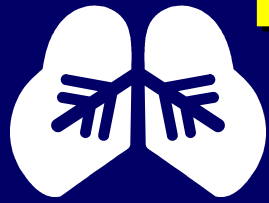
- Correction of significant hypoxemia
- Rapid reversal of airflow obstruction
- Reduction of likelihood of recurrence



Emergency Department and Hospital Management: Initial Treatment

FEV₁ or PEF >50%

- **Oxygen to achieve O₂ saturation \geq 90%**
- **Inhaled beta₂-agonist by metered-dose inhaler or nebulizer, up to three treatments in first hour**
- **Oral corticosteroids if no immediate response or if patient recently took oral corticosteroids**
- **Repeat assessment (Sx, physical exam, PEF, O₂ saturation, other tests as needed)**

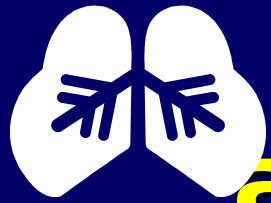


Emergency Department and Hospital Management:

Initial Treatment (continued)

FEV_1 or PEF $< 50\%$

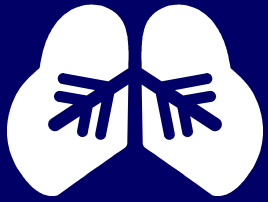
- Oxygen to achieve O_2 saturation is $\geq 90\%$
- Inhaled high-dose β_2 -agonist and anticholinergic by nebulization every 20 minutes or continuously for 1 hour
- Oral corticosteroid
- Repeat assessment (Sx, physical exam, PEF, O_2 saturation, other tests as needed)



Emergency Department and Hospital Management: Initial Treatment (continued)

Impending or Actual Respiratory Arrest

- Intubation and mechanical ventilation with 100% O₂
- Nebulized beta₂-agonist and anticholinergic
- Intravenous corticosteroid
- Admit to hospital intensive care

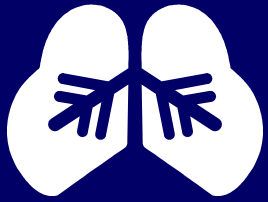


Emergency Department and Hospital Management: Treatment After Repeat Assessment

- FEV₁ or PEF 50% to 80% predicted or personal best
- Physical exam: moderate symptoms



- Inhaled short-acting beta₂-agonist every 60 minutes
- Systemic corticosteroid
- Continue treatment 1 to 3 hours, provided there is improvement

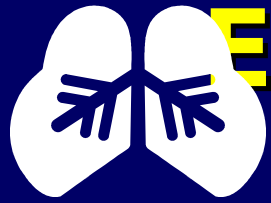


Emergency Department and Hospital Management: Treatment After Repeat Assessment (continued)

- FEV_1 or PEF $< 50\%$ predicted or personal best
- Physical exam: severe symptoms at rest, accessory muscle use, chest retraction
- History: high-risk patient
- No improvement after initial treatment



- Oxygen
- Inhaled short-acting β_2 -agonist hourly or continuously + inhaled anticholinergic
- Systemic corticosteroid

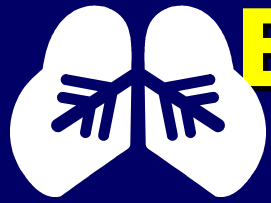


Emergency Department and Hospital Management: Good Response

- FEV_1 or PEF $\geq 70\%$
- Response sustained 60 minutes after last treatment
- No distress
- Physical exam: normal



- Discharge Home

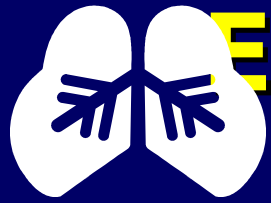


Emergency Department and Hospital Management: Incomplete Response

- FEV_1 or PEF $\geq 50\%$ but $< 70\%$
- Mild-to-moderate symptoms



- Individualized decision re: hospitalization

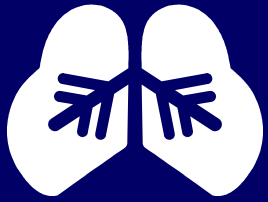


Emergency Department and Hospital Management: Poor Response

- FEV_1 or PEF $<50\%$
- $PCO_2 \geq 42$ mm Hg
- Physical exam: symptoms severe, drowsiness, confusion



- Admit to hospital intensive care

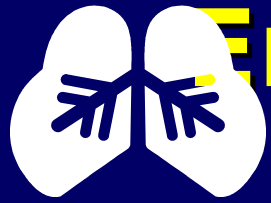


Admit to Hospital Intensive Care

- Inhaled beta₂-agonist hourly or continuously + inhaled anticholinergic
- IV corticosteroid
- Oxygen
- Possible intubation and mechanical ventilation



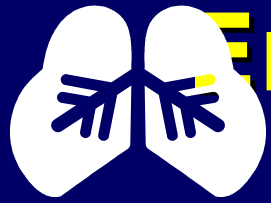
- Admit to hospital ward



Emergency Department and Hospital Management: Hospitalization

Consider:

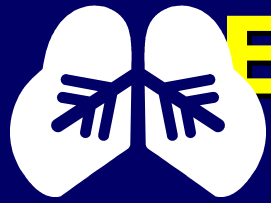
- Duration and severity of airflow obstruction
- Course and severity of prior attacks
- Medication use
- Access to care
- Home conditions and support
- Comorbidities



Emergency Department and Hospital Management: Hospitalization

Admit to Hospital Ward

- **Inhaled beta₂-agonist + inhaled anticholinergic**
- **Systemic corticosteroid**
- **Oxygen**
- **Monitor FEV₁ or PEF, O₂ saturation**



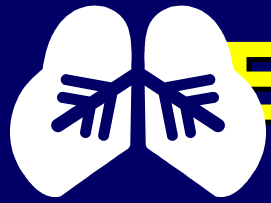
Emergency Department and Hospital Management

Not generally recommended:

- Methylxanthines
- Antibiotics (except for patients with pneumonia, bacterial sinusitis)
- “Aggressive” hydration
- Chest physical therapy

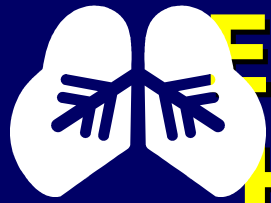
Not recommended:

- Mucolytics
- Sedation



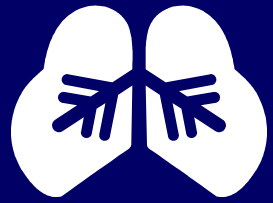
Emergency Department Discharge Criteria

- If FEV_1 or PEF $\geq 70\%$ predicted and symptoms are minimal, discharge
- If FEV_1 or PEF $\geq 50\%$ but $< 70\%$ predicted and symptoms are mild, decision is individualized
- If response is prompt, observe for 30 to 60 minutes before discharging



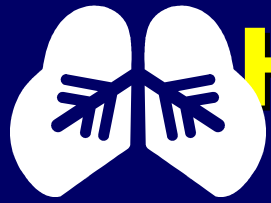
Emergency Department and Hospital Discharge Actions

- Prescribe sufficient medication and instructions for use
 - Short acting beta₂-agonist
 - Patients given systemic corticosteroids—continue oral corticosteroids for 3 to 10 days
- Schedule followup or referral visit within 3 to 5 days
 - Consider referral to specialist if patient has history of life-threatening exacerbations or multiple hospitalizations



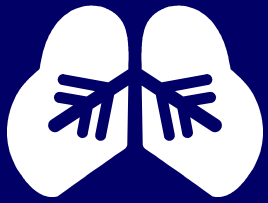
Emergency Department and Hospital Discharge Actions (continued)

- Instruct in simple action plan:
 - How to recognize signs and symptoms of deterioration
 - When to increase medications in response to deterioration
- Consider providing peak flow meter
- When possible, teach correct inhaler use and trigger avoidance



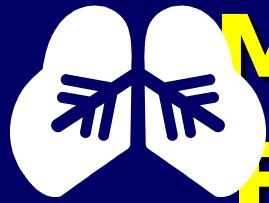
Hospital Discharge Actions

- Prior to discharge, adjust medication to an oral and/or inhaled regimen
 - This is generally done when:
 - Patient is minimally symptomatic
 - Patient has little wheezing on chest examination
 - PEF or $FEV_1 \geq 70\%$ predicted or personal best
 - Observe patient for 24 hours after adjustment



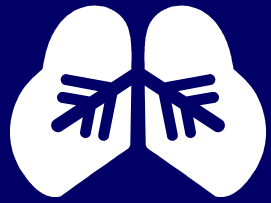
Hospital Discharge Actions (continued)

- Discharge medications should include:
 - Short-acting beta₂-agonist
 - Sufficient oral corticosteroid to complete course of therapy or to continue therapy until followup appointment
 - If inhaled corticosteroids are prescribed, start before course of oral corticosteroids is completed



Management of Asthma Exacerbations: Special Considerations for Infants

- Infants are at greater risk of respiratory failure.
- Assessment depends on physical examination rather than objective measurements.
- Use oral corticosteroids early in the episode.
- Antibiotics are generally not required. Acute wheezing generally results from viral infections and may be accompanied by fever.



Management of Asthma Exacerbations: Signs of Serious Distress in Infants

- Use of accessory muscles, paradoxical breathing, cyanosis, and a respiratory rate >60
- Oxygen saturation $<91\%$
- Lack of response to β_2 -agonist